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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
CROWELL, ANNA M

ART UNIT	PAPER NUMBER
1763	

NOTIFICATION DATE	DELIVERY MODE
07/03/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/810,694	HIMORI ET AL.	
	Examiner	Art Unit	
	Michelle Crowell	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 April 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on April 16, 2007 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. Claim 10 recites the limitation "said non-coaxially structured feeding rod" in line of page 4. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 4-6 and 8-10 are rejected under 35 U.S.C. 102(a) as being anticipated by Hayashi et al. (J.P. 2002-16045). Note. ((U.S. 2002/0042204) is used for the English translation).

7. Claims 1, 4, 8-10 are rejected under 35 U.S.C. 102(e) as being anticipated by Hayashi et al. (U.S. 2002/0042204).

The applied reference has a common inventor (Itsuko Sakai) with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Referring to Figure 6 and paragraphs [0055]-[0057], Hayashi et al. discloses a plasma processing apparatus comprising: a vacuum chamber 307 including a processing region configured airtightly closable in which predetermined processing is to be applied on a substrate 301 to be processed by action of plasma on the substrate to be processed, and of which an interior is exhausted by means of an exhaust apparatus 321 and a space separated from the processing region (Fig. 6); a bottom electrode 304 provided in said vacuum chamber and configured to have the substrate 301 to be processed placed thereon (Fig. 6); a top electrode 305

provided to face said bottom electrode (Fig. 6); a processing gas supply mechanism configured to supply predetermined processing gas into said processing region (Fig. 6); a first radio-frequency power source 309 configured to supply a radio-frequency power with a predetermined first frequency to said bottom electrode 304; a second radio-frequency power source 310 configured to supply to said bottom electrode a radio-frequency power with a second frequency that is lower than the first frequency (par.[0055]); a first power feeder having a first matching device 331 being configured to feed the radio-frequency power with the first frequency to said bottom electrode from a center portion of said bottom electrode (Fig. 6); and a second power feeder having a second matching device 332 being configured to feed the radio-frequency power with the second frequency to said bottom electrode from an outer peripheral portion of said bottom electrode (Fig. 6), wherein at least a portion of the first matching device 331 is disposed in said space (Fig. 6).

With respect to claim 4, the plasma processing apparatus of Hayashi et al. further includes wherein said first matching device 331 is electrically connected to said bottom electrode via a non-coaxially structured feeding rod (Fig. 6).

With respect to claim 5, the plasma processing apparatus of Hayashi et al. further includes wherein the first frequency is 13.56 MHz to 150 MHz (par.[0055]).

With respect to claim 6, the plasma processing apparatus of Hayashi et al. further includes wherein the second frequency is 0.5 MHz to 13.56 MHz (par.[0055]).

With respect to claim 8, the plasma processing apparatus of Hayashi et al. further includes wherein the substrate to be processed is etched by the action of the plasma on the substrate to be processed (par.[0003]).

With respect of claim 9, the plasma processing apparatus of Hayashi et al. further includes comprising: said bottom electrode 304 being disposed on an insulator plate317; and said space being formed between said insulator plate and a bottom of said chamber (Fig. 6).

With respect to claim 10, the plasma processing apparatus of Hayashi et al. further comprising: said non-coaxially structured feeding rod being located entirely within said chamber (Fig. 6).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1, 4-6, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. in view of Westendorp et al. (U.S. 5,565,036), Suemasa et al. (U.S. 6,089,181), and Hayashi et al.(U.S. 2002/0042204).

Referring to Figure 9 and column 5, lines 34-43, Kim et al. discloses a plasma processing apparatus comprising: a vacuum chamber 10 including a processing region configured airtightly closable in which predetermined processing is to be applied on a substrate 13 to be processed by action of plasma on the substrate to be processed, and of which an interior is exhausted by means of an exhaust apparatus P and a space separated from the processing region (Fig. 1, col. 2, lines 9-11); a bottom electrode 92 provided in said vacuum chamber and configured to have the substrate to be processed placed thereon (Fig. 9); 10 a top electrode 11 provided to face said bottom electrode (Fig. 9); a processing gas supply mechanism 21 configured to supply predetermined processing gas into said processing region (Fig. 2, col. 48-52); a first radio-frequency power source 96 configured to supply a radio-frequency power with a predetermined first frequency to said bottom electrode 92; a second radio-frequency power source 97 configured to supply to said bottom electrode a radio-frequency power with a second frequency; a first power feeder being configured to feed the radio-frequency power with the first frequency to said bottom electrode from a center portion of said bottom electrode (Fig. 9 and col. 5, lines 34-39); and a second power feeder being configured to feed the radio-frequency power with the second frequency to said bottom electrode from an outer peripheral portion of said bottom electrode (Fig. 9 and col. 5, lines 34-39).

Kim et al. fail to specifically teach that the second frequency is lower than the first frequency.

Referring to Figure 7 and column 10, lines 42-53, Westendorp et al. teaches a plasma processing apparatus wherein the second frequency 90 of 400 kHz is lower than the first frequency 16 of 60 MHz since lower frequencies provide relatively high voltage across electrodes and thus generates high electron energies with a corresponding increase in ionization probability. Additionally, Suemasa et al. teaches a second frequency 140 of 100 kHz-10 MHz which is lower than the first frequency 148 of 10 MHz-100 MHz (col. 4, line 62-col. 5, line 11 of Suemasa et al.). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to operate the second radio-frequency power source of Kim et al. at a lower frequency than the first radio-frequency power source as taught by Westendorp et al. or Suemasa et al. since lower frequencies provide relatively high voltage across electrodes which in turn generate high electron energies with a corresponding increase in ionization probability.

Kim et al. fail to specifically teach a first matching device and a second match device.

Referring to Figure 1 and column 4, line 62- column 5, line 11, Suemasa et al. teach a plasma apparatus having a first matching device 156 and a second matching device 144 . It is well known in the art to use an impedance match network to provide efficient power transfer between the power supplies and the electrode. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide the RF power supplies of Kim et al. with a first matching device and a second match device as taught by Suemasa et al. since it results in efficient power transfer between the power supplies and the electrode.

Kim et al. fail to teach at least a portion of a first matching device disposed in a space in the chamber.

Referring to Figure 3 and paragraphs [0031], [0046], [0056] Hayashi et al. teaches a plasma processing apparatus wherein at least a portion of a matching device 131 is disposed in a space in the chamber 107 in order to ensure that applied radio frequency is being used for producing plasma (i.e. reduce parasitic capacity, par.[0039]). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to provide at least a portion of the first matching device of Kim et al. in a space in the chamber as taught by Hayashi et al. in order to ensure that applied radio frequency is being used for producing plasma (i.e. reduce parasitic capacity).

With respect to claim 4, first matching device of Kim et al. in view of Westendorp et al. and Suemasa et al. is electrically connected to said bottom electrode via a non-coaxially structured feeding rod (Fig. 9 of Kim et al.).

With respect to claim 8, the substrate of Kim et al. to be processed is etched by the action of the plasma on the substrate to be processed (Kim et al., abstract).

With respect to claim 10, the non-coaxially structured feed rod of Kim et al. in view of Hayashi et al. being located entirely within the chamber (Fig. 3 of Hayashi et al.)

11. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (U.S. 2002/0042204) in view of Collins (U.S. 5,707,486).

The teachings of Hayashi et al. have been discussed above.

Hayashi et al. fail to teach the capacitance of the bottom electrode is set to 50 pF.

Referring to column 12, lines 2-6, Collins et al. teaches a plasma processing apparatus wherein the bottom electrode 32C has a capacitance value of 50 pF in order to diminish the losses due to the load mismatch (col. 11, lines 59-63). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the capacitance value of Hayashi et al. to be set to 50 pF as taught by Collins et al. in order to operate the bottom electrode at the desired parameters to diminish losses due to the load mismatch.

12. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. in view of Westendorp et al. (U.S. 5,565,036), Suemasa et al. (U.S. 6,089,181), and Hayashi et al. (U.S. 2002/0042204) as applied to claims 1, 4-6, 8, and 10 above, and further in view of Collins (U.S. 5,707,486).

The teachings of Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al. have been discussed above.

Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al. fail to teach the capacitance of the bottom electrode is set to 50 pF.

Referring to column 12, lines 2-6, Collins et al. teaches a plasma processing apparatus wherein the bottom electrode 32C has a capacitance value of 50 pF in order to diminish the losses due to the load mismatch (col. 11, lines 59-63). Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention for the capacitance value of Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al. to be set to 50 pF as taught by Collins et al. in order to operate the bottom electrode at the desired parameters to diminish losses due to the load mismatch.

13. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al. in view of Westendorp et al. (U.S. 5,565,036), Suemasa et al. (U.S. 6,089,181), Fukasawa et al. (U.S. 5,342,471), and Hayashi et al. (U.S. 2002/0042204) as applied to claims 1, 4-6, 8 and 10 above, and further in view of Fukasawa et al. (U.S. 5,342471).

The teachings of Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al. have been discussed above.

Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al. fail to teach a bottom electrode is supported on an insulator plate.

Referring to Figure 1 and column 2, lines 34-51, Fukasawa et al. teaches a plasma processing apparatus wherein the bottom electrode 12 is supported on an insulator plate 14. It is conventionally known in the art to support a bottom electrode with an insulator plate in order to prevent conduction between the bottom electrode and the chamber. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to support the bottom electrode of Kim et al. in view of Westendorp et al., Suemasa et al., and Hayashi et al with an insulator as taught by Fukasawa et al. since this would prevent conduction between the bottom electrode and the chamber.

Response to Arguments

14. Applicant's arguments with respect to claims 1 and 4-10 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michelle Crowell whose telephone number is (571) 272-1432. The examiner can normally be reached on M-F (9:30 -6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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